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Fax: 724-643-8069December 29, 2004  
L-04-159U. S. Nuclear Regulatory Commission  
Attention: Document Control Desk  
Washington, DC 20555-0001**Subject: Beaver Valley Power Station (BVPS), Unit No. 1  
BV-1 Docket No. 50-334, License No. DPR-66  
NRC Bulletin 2003-02  
Lower Head Inspection 60-Day Report for 1R16**

## References:

1. NRC Bulletin 2003-02: Leakage from Reactor Pressure Vessel Lower Head Penetrations and Reactor Coolant Pressure Water Boundary Integrity dated August 21, 2003
2. FirstEnergy Nuclear Operating Company (FENOC) Response to NRC Bulletin 2003-02 for BVPS (Letter L-03-138, dated September 19, 2003)

During the recent BVPS Unit 1 1R16 Refueling Outage, a visual inspection of the reactor pressure vessel (RPV) lower head penetrations was performed. This inspection was conducted per the FENOC response for BVPS (Reference 2) to NRC Bulletin 2003-02 (Reference 1). In accordance with the Bulletin, a 60-day report, detailing the inspection results is being provided. The BVPS Unit 1 Evaluation Report for 1R16 RPV Lower Head Penetration Inspections is enclosed with this letter.

There are no new regulatory commitments contained in this letter. If there are any questions concerning this matter, please contact Mr. Larry R. Freeland, Manager, Regulatory Compliance at 724-682-4284.

Sincerely,

  
L. William Pearce

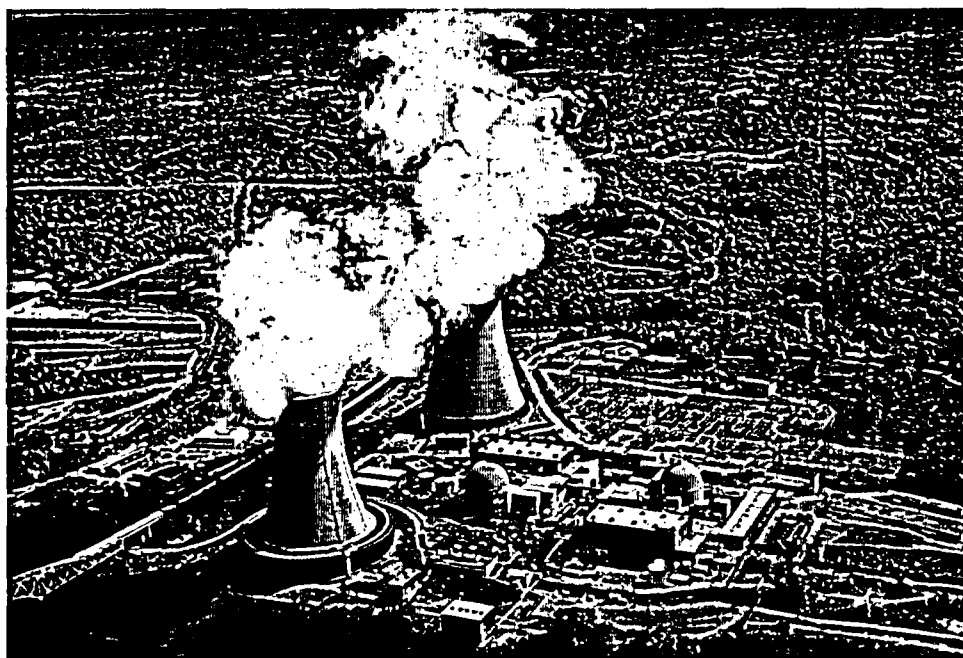
Enclosure

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c: Mr. T. G. Colburn, NRR Senior Project Manager  
Mr. P. C. Cataldo, NRC Sr. Resident Inspector  
Mr. S. J. Collins, NRC Region I Administrator

**FirstEnergy Nuclear Operating Company (FENOC)**



**Evaluation Report for**

**1R16**

**Beaver Valley Unit 1**

**RPV Lower Head Penetration**

**Inspections**

**(Ref: NRC Bulletin 2003-02)**

**December 2004**

## Introduction

NRC Bulletin 2003-02 was issued on August 21, 2003 following the discovery of two leaking RPV lower head penetrations at South Texas Project Unit 1 during the spring of 2003. The Reactor Coolant System (RCS) leakage was determined to have resulted from through-wall axial indications in the Alloy 600 tube material.

The BVPS Unit 1 commitments to Bulletin 2003-02 for the 1R16 refueling outage were as follows:

1. Visual inspection of all 50 Bottom-Mounted Instrumentation (BMI) penetrations including 100% of the circumference of each penetration as it enters the RPV lower head to the maximum extent practical. (Reference: L-03-138, dated September 19, 2003).
2. Should potentially interfering deposits be discovered during the visual inspection of the BVPS Unit 1 lower head penetrations, prudent measures will be taken to ensure the integrity of the RCS pressure boundary. These measures may include cleaning, boron/lithium analysis, chemical analysis, etc., depending on the nature of the deposits. Discoveries made requiring actions outside the scope of the planned evolutions may require additional planning, tooling, and personnel. Such evolutions may be postponed until the subsequent refueling outage to provide sufficient time to plan appropriate corrective actions that address the conditions that may be discovered as well as personnel safety and ALARA considerations. (Reference: L-03-191, dated December 2, 2003).

## RPV Lower Head Configuration

The BVPS Unit 1 reactor vessel lower head contains 50 BMI penetrations fabricated of Alloy 600 tube material. The penetrations have an outer diameter of 1.5" and are clearance fit into the bottom of the reactor vessel. The tubes are attached to the vessel by an Alloy 82/182 attachment weld on the inside diameter surface of the vessel.

The BVPS Unit 1 reactor vessel is insulated. The original insulation package conformed to the surface of the vessel in the area of the RPV lower head penetrations. This design provided for limited access to the BMI penetrations as they enter the lower head, due to the ~2" – 5" clearance between the outside surface of the reactor vessel and inside surface of the insulation package. In order to facilitate the 1R16 exams, the entire insulation package in the area of the BMI penetrations was removed. Following the inspections, a modified insulation package was installed, providing adequate clearance between the reactor vessel and the insulation package, as well as, eight removable access doors, for enhanced inspection capability during future outages.

## Inspections Performed

The BVPS 1R16 RPV lower head examination scope was completed as follows:

- As-found visual inspection of all 50 BMI penetrations including 100% of the circumference of each penetration as it enters the RPV lower head.

- CO<sub>2</sub> cleaning of the reactor vessel base metal surface and penetrations in the area of the BMI penetrations.
- As-left (post-cleaning) visual inspection of all 50 BMI penetrations including 100% of the circumference of each penetration as it enters the RPV lower head in order to establish a baseline condition for future examinations.

The as-found and as-left visual inspections were performed by Westinghouse/R. Brooks using semi-remote camera technology. Inspection results for each penetration were indexed using the four-quadrant (A, B, C, and D) system typical of remote visual inspections of RPV head penetrations. A total of 200 quadrants (50 BMI penetrations x 4) were inspected using this technique in both the pre- and post-cleaning conditions.

Both the as-found and as-left visual inspections were documented on videotape, still images, and VT-2 inspection logs. All examinations were performed by FENOC/Westinghouse VT-2 qualified personnel, and approved by the FENOC Level III visual inspector.

## **Inspection Results**

### *As-found Inspection*

The as-found visual inspection of the 50 BMI penetrations was completed including 100% of the circumference around each penetration as it enters the RPV lower head. The examination identified no indications of through-wall leakage from any of the BMI penetrations.

The carbon steel base metal surface of the reactor vessel exhibited historical surface rusting and rust staining, however, none of the staining obstructed view of the annulus between each BMI penetration and the vessel surface. This condition was expected, as the reactor vessel was exposed to reactor cavity seal leakage (prior to installation of a permanent cavity seal) several times throughout its operating life. Prior to 1R16, preparations were made to perform chemical sampling of any boric acid accumulation on the bottom of the vessel, if necessary. However, the as-found condition of the vessel showed only minor boric acid staining of no appreciable volume and no wetted conditions anywhere on the reactor vessel or in the reactor vessel keyway area, indicating that none of the surface staining on the vessel surface had resulted from a presently active condition. As such, no chemical sampling was performed following the satisfactory as-found visual inspection.

### *RPV Lower Head Cleaning*

Although no "potentially interfering deposits" were identified during the as-found visual inspection of the BMI penetrations, the bottom of RPV surface and penetrations were cleaned to remove the historical surface rust and staining to conform with FENOC's general cleanliness standards. The RPV surface and penetrations were cleaned using a CO<sub>2</sub> blasting technique to remove loosely adhered rust and staining. While some staining of the RPV surface remains post-cleaning, the as-left conditions provide an acceptable baseline for the determination of historical versus actual conditions in the future, of both the BMI penetrations and RPV surface.

### *As-Left (Post-Cleaning) Inspection*

Following CO<sub>2</sub> cleaning of the RPV surface and BMI penetrations, the 50 BMI penetrations were re-inspected using the same techniques, acceptance criteria, and personnel as were used in performance of the as-found inspection. Again, 360° around the annulus of each penetration was clearly visible and unobstructed. The as-left conditions, therefore, provide an acceptable baseline for comparison to future visual inspections.

### **Summary**

Visual inspections of the 50 Beaver Valley Unit 1 RPV lower head penetrations within the scope of NRC Bulletin 2003-02 were completed during 1R16 in accordance with BVPS commitments identified in FENOC Bulletin responses L-03-138 and L-03-191. The as-found visual inspection identified no indications of leakage from any of the 50 BMI penetrations. The as-left condition of the RPV surface and BMI penetrations is an acceptable baseline for comparison to future visual examination results. Furthermore, the modified insulation design installed during 1R16 provides ease of access to each BMI penetration to facilitate future examinations. Future inspections will be performed in accordance with the frequencies and methods previously identified in BVPS commitments to Bulletin 2003-02.